

Claims

What is claimed is:

1. An apparatus for operably conveying heat away from a heat source, said apparatus comprising:

5 (a) a thermally conductive substrate having first and second opposed sides and a thickness defined between said first and second opposed sides, the thickness of said substrate forming a planar boundary thereof; and

10 (b) an insert portion disposed in said substrate and being positioned so as not to extend beyond said planar boundary, said insert portion having a thermal conductivity value of at least 1.5 times that of said substrate along at least two axial directions, with one of such axial directions extending substantially perpendicularly to said
15 first and second opposed sides, said substrate being operably disposed adjacent to the heat source such that at least a portion of said insert portion is in immediate thermal contact with such heat source.

2. An apparatus as in Claim 1 wherein said insert
20 portion has a thermal conductivity value of at least 2.5 times that of said substrate along at least two of such axial directions.

3. An apparatus as in Claim 1 wherein said substrate
25 is selected from the group consisting of copper, copper tungsten alloy, aluminum, silver, gold, alumina, aluminum nitride, boron nitride, epoxy, and engineering thermoplastics.

4. An apparatus as in Claim 1 wherein said insert
30 portion is selected from the group consisting of diamond, highly oriented pyrolytic graphite, pitch based graphite, aluminum, copper, and copper tungsten alloy.

5. An apparatus as in Claim 1 wherein said insert portion extends at least 10% through said substrate thickness from said first side thereof.

6. An apparatus as in Claim 1 wherein said insert
5 portion includes one or more arms extending radially outwardly from a first location in said substrate immediately adjacent to, and in thermal contact with, the heat source, said radial arms extending within said planar boundary.

10 7. An apparatus as in Claim 6 wherein said radial arms of said insert portion have a lateral width of between about 30% and about 70% of the diameter of a thermal footprint generated by the heat source.

8. An apparatus as in Claim 6 wherein said radial
15 arms of said insert portion have a length of greater than about 150% of the diameter of a thermal footprint generated by the heat source.

9. An apparatus as in Claim 1 wherein said substrate is a generally planar body adapted for securement to various
20 heat generating devices.

10. An apparatus as in Claim 1 wherein said substrate includes a plurality of fins extending outwardly from said second surface thereof, with said first surface of said substrate being operably coupled to the heat source.